



The North West Corporation, Limited,

and

The Yukon-Klondike Gold Industry.

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Registered Office of the Company:

6, AUSTIN FRIARS, LONDON, E.C.



The North West Corporation, Limited.

CAPITAL (AUTHORISED) - - £1,500,000,

In Shares of £1 each.

ISSUED (or under Contract to be issued) - £1,400,000 (including the 200,000 Cash Working Capital Shares).

IN RESERVE - - - £100,000.

Directors.

M. H. ORR-EWING, Esq., 6, Austin Friars, E.C.

W. TRASK, Esq., 6, Austin Friars, E.C.

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Hon. C. M. KNATCHBULL-HUGESSEN, 8, Old Jewry, E.C.

A. N. C. TREADGOLD, Esq., *Managing Director*, 6, Austin Friars, E.C.; and Dawson.

Solicitors.

Messrs. SPYER & SONS, Austin Friars House, London, E.C.

Auditors.

Messrs. ANNAN, DEXTER & CO., 21, Ironmonger Lane, London, E.C.

Bankers.

MARTIN'S BANK, LIMITED, 68, Lombard Street, London, E.C.

Registered Office.

6, Austin Friars, London, E.C.

THE NORTH WEST CORPORATION, LIMITED,

AND

THE YUKON-KLONDIKE GOLD INDUSTRY.

EARLY FAME AMPLY JUSTIFIED BY PRODUCTION.

The Klondike Field was made suddenly famous by the rush of gold-seekers in 1897, and the good areas were parcelled out into many thousand claims among the "old-timers," as the miners of the early days are called. A year's work showed an unusually rich and extensive Field. The then newly appointed Governor of the Territory was thought insane for expressing the opinion that $200,000,000.00 (£40,000,000) would be won from the Field. It is fifteen years since then and already upwards of £40,000,000 has been recovered, most of it by pick and shovel from scattered rich patches only, leaving the bulk unworked.

HISTORY OF CONSOLIDATION.

The original owners by means of numerous trial-workings and sampling-shafts distributed over the length and breadth of these areas proved the continuity of the pay-channels throughout them and determined the values of the gravels. Their work proved that only a small proportion of the claims was rich enough to yield a profit when worked by hand methods—the only methods then available. The cost of hand methods with labour at £1 8s. 0d. per man per day stood at about 8s. per cubic yard (seldom lower, often higher) and could not be reduced except by the substitution of machinery for hand-labour, as in other Fields e.g. California, where already in 1899 low costs (5d. per cubic yard and lower) were beginning to be reached. In spite of this remarkable difference in costs against the Klondike, some of these old-timers continued until 1904 to work selected rich patches in their claims ; but the majority ceased to attempt production at such a disadvantage, and began to combine their separate claims into groups for the purpose of reducing the cost of working. This co-operative movement among the owners of claims was encouraged by the largest owners, working together to consolidate as many as possible of the best areas of the Klondike Field into one Company, in order to secure the benefit of the reduction in working cost which they foresaw.

THE NORTH WEST CORPORATION.

The North West Corporation is their Company, linking together their properties and groups of properties and employing their successful working methods. It has taken fourteen years to bring about this consolidation and develop the working methods, to deal with the many thousand separate properties and their numerous owners and to overcome the difficulties connected with the treatment of the gravel-beds in this new Field.

THE EFFECT OF CONSOLIDATION ON THE DIVISION OF THE FIELD.

The whole Klondike Field is now controlled by three working groups, viz.:—about five-eighths of it by the North West Corporation (Capital £1,500,000) and three-eighths of it by the Yukon Gold Company (Capital £3,500,000) of New York, and the Canadian Klondyke Company (Capital £1,600,000) of Ontario.

Of the above three Companies two—viz., the Yukon Gold Company and the Canadian Klondyke Mining Company are already large producers, having produced over £3,500,000 (net profit about £2,000,000); they have only recently got into full working. The North West Corporation will commence production in 1914.

THE PROPERTIES.

The North West Corporation has been formed to acquire and work under one management about 75 miles out of the 120 miles (roughly) of pay-channels constituting the best and most productive portion of the Klondike District.

The titles to the properties are held direct from the Government of Canada.

THE BASIS OF THE INDUSTRY.

These pay-channels are gold-bearing gravel-beds covering the wide valley-bottoms from 18 to 36 feet deep and from 300 to 7,000 feet wide.

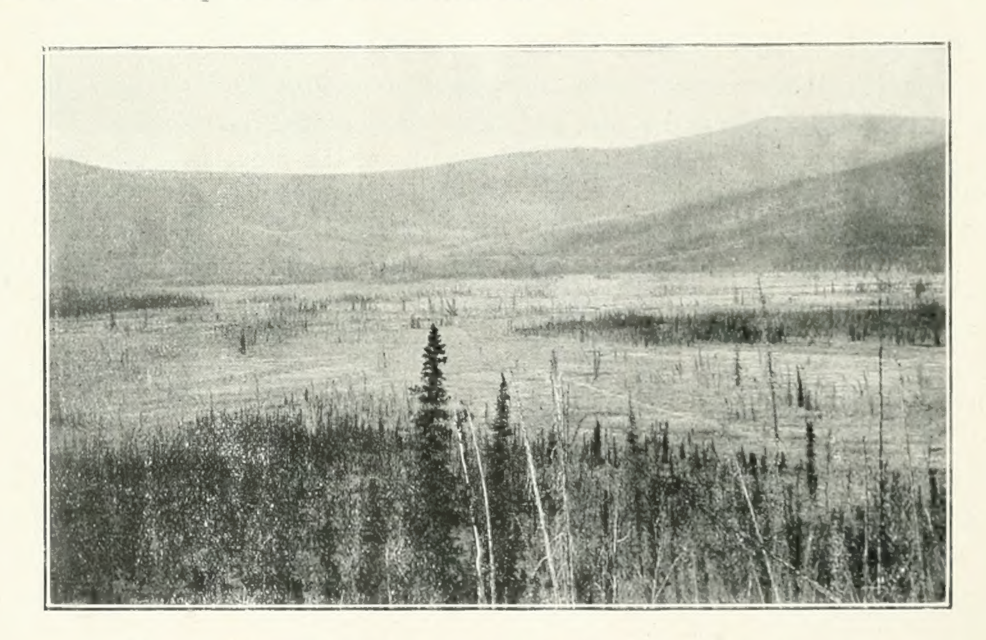


Plate 1.—Shows the wide bottom of the Dominion Valley in its virgin condition, before the trees and other vegetation are removed. The bed of the present stream is about 60 feet wide in this mile-wide valley bottom (*see* Plate 14.)

Such words as "Mines" and "Mining" are not properly applied to these pay-channels and to the working of them; for they are merely beds of gravel covered with soil and they are being worked by open cuts or pits like ordinary gravel-pits.

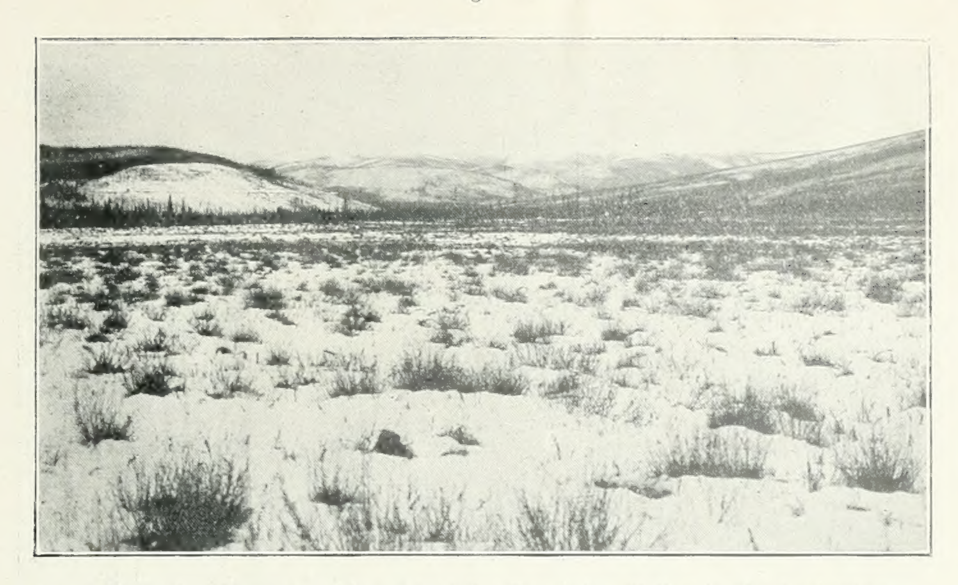


Plate 2.—Shows a wide part of the Dominion Valley in the beginning of Winter. The line along the hillside on the left side of the picture is one of the Company's Canals carrying a supply of water up the valley to work. The surface can be frozen, while beneath all may be thawed and easy to work for a heavy machine digging from below upward. This area could be worked in November as well as in July.

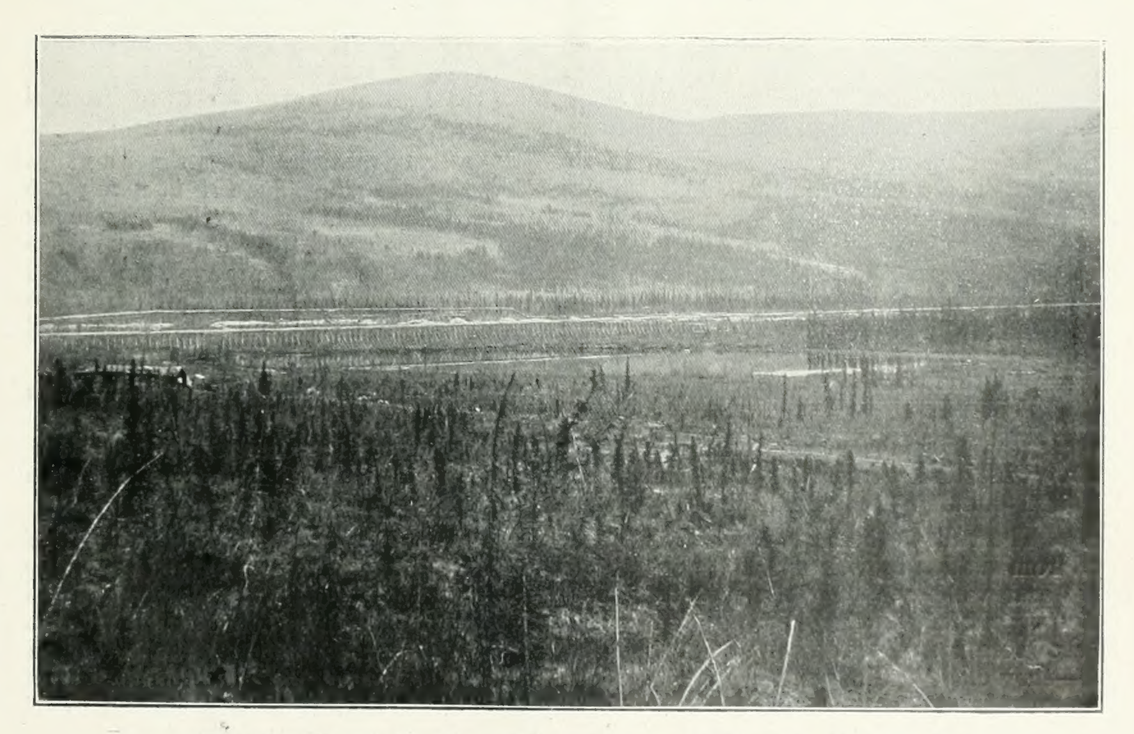


Plate 3.—Shows the wide-valley at the mouth of Sulphur Creek. Here in a width of 7,000 feet the old workings cover about 100 feet wide only. The white heaps are the tailings from the old workings. The new workings of this Company already embrace over 2,000 feet wide of highly payable gravels in this part of the valley.



Plate 4.—Shows open gravel-cut in the Quartz Valley—note how small and easy to dig the gravel is when once thawed.

Thus the problems connected with the treatment of them are not mining problems at all; there is no underground work, after the sampling stage is passed, and the depth from surface to bottom seldom exceeds 36 feet, so that we are never far away from the gold, at deepest, and sampling is comparatively easy.

Equally simple is the treatment of the gold-bearing material (the gravel and bed-rock) for the separation of the gold. No expensive separate plant, such as is required for the ordinary processes of recovering gold from rock, is needed, but merely water, which costs nothing. The material is fed into a stream of water flowing continuously over inclined washing-tables; the gold, occurring as free particles in the gravel, sinks by its own weight to the bottom of the stream and is caught in the slots with which the tables are fitted; the gravel passes over the tables into the sluiceway and through it to the tailings-heap.

The gold comes originally from the breaking up of the country rock, which throughout the productive areas is remarkably uniform in character. It is very full of quartz (the original source of the gold) and when exposed to the disintegrating action of water, wind and weather, it breaks up small—a fact which explains the entire absence of large boulders in these deposits—a favourable feature in working them.

The valleys themselves are noticeable for their gentle and regular gradients, entirely free from sudden falls and violent changes of level. The streams, which carved the valleys deep and wide out of the massive country rock, did their work very slowly and very gradually through a very long period of uniform conditions, cutting their beds slowly down to the present drainage level, at which, owing to the gentle gradients—to the eye almost flat—they could no longer carry off the rocky débris (the gravel, etc.), which commenced to accumulate in the stream-beds. This deposition of gravel in the bottom of the valleys went on as slowly and with the same persistent uniformity of general conditions as the previous cutting, until the gravel-beds, as we know them to-day, were deposited continuously from the mouth of each valley backward upstream to the upper end of the deposit in the head of the valley. There is no trace of any violent disturbing earth-movements during the whole process.

This long-continued uniformity of conditions during the cutting of the valleys and the subsequent deposition of the gravel-beds on these gentle gradients is of infinite importance to the gold-industry :—

> In the first place it accounts for the general dissemination of the gold throughout the gravels. The pay-channels vary, of course, in richness from side to side and from end to end of the deposit in any particular valley ; but they do not break off ; there is a continuity which can be depended upon and, after sampling, can be fairly estimated, affording a reliable basis for the industry of working them.
>
> In the second place it ensures uniformity of working conditions affecting the treatment of very large homogeneous areas of ground—a very valuable feature for those who study the reduction of working costs.

THE AURIFEROUS DEPOSITS—THEIR PECULIARITY.

The gold-bearing gravel-beds covering the wide valley-bottoms are in their virgin condition thickly overgrown with vegetation (moss, grass, bushes and trees) and frozen solid.



Plate 5. Shows the surface vegetation growing over the gravel-beds and keeping them frozen in one of the Company's richest areas. Tunnels are driven through the frozen gravel thirty feet beneath this surface to test the values of this virgin ground.

The vegetation acts as an insulating blanket, excluding the sun and keeping the ground frozen. In this frozen state it cannot be excavated ; no machine, however powerful, can dig frozen ground. By means of injected steam it can be thawed, but this artificial thawing costs from 6d. to 8d. per cubic yard. In the rich areas of the Klondike Field, where the values frequently run from 2s. 6d. up to £1 per cubic yard, even this heavy expense can be justified, because it at least enables large digging plants to be substituted for hand labour and so reduces cost. But to those of us who had studied conditions other than those in the Klondike and knew that the total gold contents in the average Californian gravels do not exceed 6d. or 7d. per cubic yard, this expense for thawing seemed too great and, as always expected, experience has shown that the thawing can be accomplished without any such expense by the inexpensive method of admitting the sun's heat to do the work. In other words, if the surface vegetation is removed, the underlying soil, thus exposed to the warm air and sun, commences to thaw out.



Fig. 6. Shows detail of the coarse tussock grass and scrub to be cleared away before the sun can get in to thaw the ground, which is frozen solid at the roots of these tussocks.

This frozen condition—the main peculiarity of the Klondike deposits—is caused by the thick vegetation growing upon their surface, coupled, of course, with the predominance of very low temperatures during the long Winter (the Winter is the ordinary long Canadian Winter from about mid-December to the end of March but the average temperature in Klondike during that period is much lower than in the nearer parts of Canada, where the Winter is about as long but not so cold).

We cannot change the cold climate, but we can remove the surface vegetation which keeps out the hot sun of the Northern Summer and prevents the thawing which would naturally result from the contact of this earth-mass with the warm air, especially in the hot Northern Sun. The vegetation is a non-conductor of heat; the underlying soil is a slow but sure conductor of heat; the underlying gravel is a more rapid conductor of heat.

The rapidity of this thawing depends upon the relative abundance or scarcity of ice in the mass of frozen earth and upon the drainage provided for the water which results from the thawing of the ice in the mass. The gradients of these Valleys (their fall averages from 18 to 50 feet per mile) are more than sufficient for all the purposes of draining off the cold water. If for any reason we desire to hasten the rate of thawing out, we can do so by circulating water at its warm summer temperature through the mass. But with large exposures of surface no expedients are needed; the rate of thawing is rapid enough for all purposes.

When once we have disturbed the equilibrium of the permanent frost in the ground by clearing away the surface vegetation and letting in the sun, we have turned the scale entirely in our own favour. The thawing process thus started will continue until the whole mass is thawed: the main cause of frost having been removed, the sun does the rest; the once permanently frozen ground soon becomes thawed and can be treated just like ordinary gravel-pits. The cold of the following Winter will attack and freeze the surface

of this exposed and thawed mass to a depth of from four to eight feet, but this surface frost disappears very quickly in the following Spring and is a very different thing to contend with from the original permanent deeply-frozen condition.

The margin of saving (6d. to 8d. on every cubic yard treated) by employing the heat of the sun instead of injected steam for thawing is so huge that it must be allowed to dictate the method of treatment.

To apply the treatment and effect this saving, large connected areas are essential, under one control, carrying also control of the Water Supply and, when once the saving is thus ensured, the larger the areas owned, the larger, of course, is the resulting benefit.

The founders of this Company have proved by means of a large amount of work done on the properties, that their method of treatment is as efficacious as it is simple, and thus they have made this important saving in cost applicable to the 20,000 acres (600,000,000 cubic yards) controlled by the North West Corporation.

THE GRAVEL-BEDS AND THEIR GOLD.

Over the surface grows a dense mat of vegetation (shown in plates 5 and 6, etc.), beneath which comes a thick layer (from 8 to 20 feet thick) of soils, silts and clays, often mixed with peat and other vegetable matter and containing a varying but usually considerable proportion of ice and little or no gold, except, perhaps, very fine gold. The vegetation and soils, etc., are usually termed "over-burden" as distinct from the underlying gravel. In the gravel the gold occurs in fine or coarse particles, free, distributed throughout. The gravel, varying in thickness, according to the locality, from 7 to 24 feet, must all be washed, for the separation and recovery of the gold.



Plate 7. Open cut, [illegible] bedrock. The bedrock [illegible] has been cleaned [illegible] quartz pebbles [illegible] scattered over the [illegible] encountered in the gravels, which are [illegible]

Last and lowest down comes the "bedrock" or rock floor of the valley the bed of the original stream while it was cutting the valley and before the gravels were deposited in the stream-bed all over the bottom of the valley. The bedrock for two feet or more next below the gravel is in some places soft, having become decomposed almost into clay ; in other places it is hard. When hard it is almost invariably much fissured and, broken small, not difficult to dig.

The stream, which cut these valleys down to the level of the present rock-floor, washed the gold into the open fissures of the bedrock over which it flowed and whose nature is such that it readily cracks and opens into fissures when exposed, as in this case in the bed of the stream ; the upper two feet or more of this broken and (in places) decomposed rock must therefore be excavated and washed for gold with the gravel. This upper portion of the rock-floor or bedrock, being thus broken or decomposed, presents no difficulty to the heavy excavating plants.

THE TREATMENT.

The necessary large areas, having been brought under one control, canals of large capacity have been built from points in the stream-beds along the favourable hillsides



Plate 8. Shows a canal built along the hillside well above the bottom of the valley. These canals have proved to be excellent carriers of water, becoming in one season quite tight and impervious, even in stony ground, by reason of the heavy nature of the surface soil.

parallel to the valley bottom, but clear of it and above it, on a gradient of four or five feet to the mile, as compared with the 20 to 40 feet per mile gradient of the Valley-bottom.

In this way the stream is diverted from its old bed in the Valley-bottom to a new bed along the hillsides with the result that all the water can be controlled and, by means of pipes connecting any desired point along the line of the canal with any desired area to be worked in the valley bottom, can be directed against any piece of ground, which it is desired to work.



Plate 9. - Shows dam built across the Dominion stream-bed close to one side of the Valley—a good place at which to divert the stream. When the gates of this dam are closed, the water of the Creek is raised nearly to the level on which the men are standing and forced into our Canal, whose intake is just above the dam and is built into the hillside.



Plate 10. Shows the line of a canal along the hillside and a pipe connected with it to conduct a supply of water under pressure down the hill into the Valley-bottom to be used in the cut. When once the stream is flowing for us in a canal at this higher level, it is available by its own weight through a pipe, as here, for all kinds of work whether removing overburden and waste or washing the gravels for the gold.

In this way two essential advantages are gained : Firstly, all the water is brought under control and harnessed by means of pipes to any desired piece of work and, Secondly, the difference in elevation between the line of the canal and the Valley-bottom gives a pressure in the enclosed pipe to the water, enabling the water to be used through the nozzles at the end of the pipe as a controlled force for tearing down and removing these deposits.



[illegible] the Dominion Valley. This powerful stream of water [illegible] at the [illegible]. About six feet [illegible] being peeled off in one layer at this point. The trees, bushes, etc., are left on [illegible] burnt. The Canal, which supplies the water, is built along the hillside to the left and the pressure of the water is due to the elevation of the canal above the place where the water is being discharged from the pipe through the nozzle.

With the water of the valley thus elevated in the canals and controlled, the work of economic treatment can be laid out on a connected plan. There are available for use annually through the Company's canals not less than 75,000,000 tons of water capable of being directed so as to use its whole weight upon the disintegration and removal of these earth-masses. If required, this large tonnage of water can be used over and over again in its course down the valleys, thus increasing the facilities for treating additional yardage constantly. In the areas where the local water supply is scanty, a supply of Electric Power is required to drive the pumps, which are necessary to repeat the water-supply, picked up by the pumps in the stream-bed at the lower end of the open cut, in which work is proceeding, and by them pumped back over and over to be discharged through the nozzles at the mass of overburden which is to be removed.



Plate 12.—Shows a wide valley in which the surface vegetation is being burnt (hence the smoke) to clear off as much as possible preparatory to turning the water upon it to wash away the overburden. The Company's buildings in the foreground.



Plate 13.—Shows the Hydraulic Superintendent directing the stream through the Monitor to tear off the surface vegetation and overburden. One man handles the Monitor, i.e., the movable hydrant and nozzle. Water at this pressure will disintegrate and displace any such material with ease.

The method of treatment is as follows :—First, the live vegetation is cleared off over an extensive area by setting fire to it, wherever possible, and letting it burn in the dry season or by playing water upon it at a pressure through the nozzles and so tearing it to pieces and washing it away. The underlying soil, thus exposed, thaws from four to six inches deep daily. This thawed soil on the surface is swept away by the stream of water played upon it at a pressure through the nozzles and is carried off in suspension in the water into the stream-bed and so on down the valley. If the stream is required for use a second time farther down the valley, it is conducted, thus loaded with soil in suspension, to a worked-out cut or gulch, where it can be confined. Thus confined, it deposits the soil as mud and is then allowed to overflow and pass onward available for use at points farther down the valley.



Plate 14. Shows the present stream meandering in its narrow bed about the wide Valley-bottom. It flows on the top of the gravel between high banks of deep overburden; all this overburden has to be removed down to the level of the water, i.e., to the top of the gravel. The white marks on the bottom of the valley are the heaps of tailings from the early hand-workings.

The water of the valley in the creek-bed (stream-bed) flows upon the top of the gravel in the undisturbed condition of these valleys between banks of overburden, so that the overburden, when attacked by the stream of water through the nozzles, is all the time being washed from each side **down** into the creek-bed (*see* Plate 14).

Where the creek-bed is very sinuous, we make a new straight cut down the valley so as to make the stream travel as fast as possible with its load of soil from our work.



Plate 15.—Shows a new straight cut down the Dominion Valley (where the creek-bed is very sinuous) preserving all the fall of the valley, so that the stream travels at the greatest possible speed carrying off its load of overburden straight down the valley on the natural gradient of the valley. The old creek-bed is seen dry, cut through by the new cut nearly at right angles

It is obvious that large areas exposed and giving a thawed surface a few inches deep every day over *all* their extent can be made to yield any desired amount of cubic yards limited only by the size of the area thus exposed. Our practice is to keep the water playing upon thawed earth only and never to waste time and water on frozen earth. The water sweeps the thawed dirt easily off the icy surface of the frozen dirt.



Plate 16. Shows the application of water under pressure to the work of removing the overburden as it thaws in the sun. Layer after layer of soil mixed with ice is thus peeled off and carried away in the stream of water from the two "Monitors," i.e., movable hydrants and nozzles.

When all the overburden has thus been peeled off in a thawed condition, the gravel beds are left exposed to the sun and warm air and rapidly thaw out, so that in due course they can be treated by excavating plants of the largest capacity, just like the gravel beds of any other country.



Plate 17. Shows open cut with overburden removed down to gravel with the stream flowing from right to left carrying off the overburden washed into it by the "Monitors." The heaps of gravel on the surface are the tailings from the old workings. These tailings as we come to them, are let fall upon the gravel to be treated for their gold when we later treat the gravel, etc. "Tailings" means gravel already once washed for gold. Most of the old tailings on these areas carry highly payable values still.



Plate 18. Shows the gravel left exposed to thaw, after removal of overburden of about 15 feet deep. The background shows overburden still in place.

The above shows the importance of water as an agent in our service for tearing down, disintegrating and carrying away the " overburden " of soil, silt and clay, all of it very fine material intermixed with ice.



Plate 19.—Shows overburden containing a large proportion (quite 50 per cent.) of ice mixed with the soil. The vegetation has been removed from the surface and streams of water turned loose over it. Note how it is cut up by the action of the water. This is very easy ground to work, when the sun is let into it.

Water is an agent that needs no repairs, never wears out, works for us incessantly day and night, and, although it can be so violent, it is so easily controlled that one of our men, using the proper equipment, can direct 30,000 tons of it in 10 hours against the mass of earth to be removed by it. In fact, our use of water, coupled with our use of the sun's heat, are proofs of our turning to good account the natural forces of the country itself, which, when harnessed, contribute greatly toward successful treatment of these gravel-beds.

We use water to remove one-half (the upper half); the other half (the lower half) must be excavated by machinery for treatment ; we drive our excavating machines by electric power, which we generate from water, and, as we dig the gravel, we separate the gold from it by means of water. In all these uses water is a very economical helper, lending itself cheaply for use over and over again down the long stretches of valley controlled by the North West Corporation.

But water has also its limitations in our service. While it can carry off in suspension the finely powdered material of which the overburden consists, it cannot, on the gentle gradients prevailing in our properties, carry away the gravel, although it can disintegrate and tear this latter out of place. In treating the gravel we prefer to use a mechanical excavator of some kind, which can dig and remove the gravel and loose bedrock and deliver them to the washing apparatus, where the gold is separated from them.

The excavators, which dig the gravels, either float in a pond (dredges) or work dry on rails. In the deep gravels of those valleys, in which water is superabundant, we are almost compelled to use the floating diggers; in the shallow gravels in the wide valleys,



Plate 20. Shows an excavator of the floating type a Dredge treating the gravels. The digging end is towards you. The tailings are being thrown out behind after the gold has been separated from them.

where drainage is easy, it is a great advantage to be able to use the dry excavators, which cost very much less to buy and to maintain and permit all the digging to be done in the open, so that the engineer sees exactly what he is digging and can direct the machine accordingly. This is the only way to recover all the gold from the bedrock.



Plate 21.- Shows an excavator digging dry in an open cut, permitting all the digging to be inspected closely. This machine is built to take up six cubic yards at each lift and elevate this ten ton load at the end of the 80 feet long jib to the desired height.

It is obvious from the above that the working of these gravel-beds does not involve "mining," as ordinarily understood. It is a matter of moving so much material from place in the gravel-beds and incidentally washing it while conveying it to a resting-place, where it will not require to be touched again.

In a work of such size it is fortunate that the overburden layer is composed of finely powdered material, which passes off readily in suspension in water, and thus fully half the material is moved and carried clear away merely by water without wear and tear of plant. Any gold in the overburden thus disposed of is deposited in the gravel over which the stream of water, thus loaded with soil, flows; and we recover it, when we dig this gravel later on.

When we come to the gravel, we have to choose the digging machine, which will produce the best result. Other things being equal, we prefer to dig in an open cut or pit, so that we see the bedrock (i.e. the bottom of the gravel-beds) all the while, since rich concentration of gold often occurs in it and sometimes escapes untouched in the case of floating excavators, which dig the gravel and bedrock out of sight deep under water.

In general, the washing of the gravel involves far less expense than the digging of it —the initial outlay for all washing apparatus is small and most of the parts subject to heavy wear and tear can easily be protected and cheaply renewed. It is not a matter of crushing rock to get the gold. The gold occurs free, as loose particles disseminated throughout the gravel, which only needs to be washed in order to recover the gold.

In view of the large amount of material which these machines are capable of excavating daily, it will be seen how necessary it is to have the big stretches of ground ready to enable them to operate to full capacity without cessation. Any obstacle, such as a mass of frozen earth, would at once stop the machine, whose economy depends partly upon the continuity of its operations. Here we see the advantage of large areas exposed to the force of the sun and thawing out simultaneously, producing a homogeneous result, in advance of the machines.

WORK DONE TO DATE.

The work we have already done is large in amount and of a permanent character in view of the long life assured to the Field. Thus the plant from which the supply of Electric Power is derived is of the finest possible kind ; the Canals which conduct the Water Supply are so placed as to conserve and conduct at the requisite elevations for pressure all the water supply of the District to be served ; all the water is thus pressed into our service and does work for us by its own weight in removing overburden or in washing gravel.

The cuts, in which over 2,000,000 cubic yards have already been removed at very low costs ranging from 1d. up to 5d. per cubic yard (but averaging well below 4d., under conditions which will be greatly improved with more and better equipment), have been so arranged as to ensure the maximum exposure of surface of gravel to thaw and to give the greatest possible assistance for future operations.

A large amount of systematic sampling has been done continuously during the past five years. The method consists in testing ahead in the unproved areas with a view to adding each year to the proved areas.

SOME REMARKABLE ECONOMIES IN FAVOUR OF THIS COMPANY.

The remarkable reduction of the working cost from the early 8s. in this Field to 5d. and under per cubic yard now established for these areas naturally presents some notable individual features of economy. For example, labour, which used to cost by hand methods 5s. per cubic yard, now costs from 1d. to 2d. when assisted by excavating machinery and modern methods. The items of Power and Water together now cost 1d. per cubic yard (they used to cost 3s.).

By merely using the sun's thawing power, instead of steam, on the ground this Company saves 6d. or more on every cubic yard treated. This saving alone means £175,000 per annum on the treatment of the planned minimum of 7,000,000 cubic yards.

This low working cost adds an immense sum to the total net profit from the high-grade gravels (running 1s. 3d. per cubic yard and in some areas very much higher) of which large amounts have been reserved for treatment until these methods became available. In addition this low cost makes a very large additional amount available for treatment, thus greatly lengthening the life of the enterprise.

This Company controls remarkably extensive, connected areas, so that it will be in a position to take full advantage of the economies to be gained. Already it has a very large acreage under treatment and before the end of 1914 will have cleared sufficient ground to keep well in advance of extraction. Actual production will commence during 1914 and a minimum treatment of 7,000,000 cubic yards will be maintained each year thereafter

VALUES.

The areas of gold-bearing gravels controlled by the North West Corporation comprise over 20,000 acres containing 600,000,000 cubic yards (approximately), of which about one-half has been proved by many thousand well-distributed tests: 100,000,000 cubic yards in the high-grade areas show an average of 1s. 3d. per cubic yard gross (parts run up to 2s. 6d. per cubic yard gross) and 200,000,000 cubic yards an average of 10d. per cubic yard gross. The other half of the areas has not yet been sufficiently explored to estimate values closely; but, from their situation within the pay-channels and from the prospecting work already done, they may confidently be expected to yield large additional amounts of payable gravels.

In estimating values for the yardage estimated above, allowance has been made for the fact that the "overburden" of soil and ice spread over the gravel-beds carries no gold to speak of; consequently, when the "overburden" has been removed by our "peeling" process of treatment in advance of the treatment of the gravel, the values of the gravel itself are, on the average, twice the amount stated; so that when, for instance, an average value of 1s. 3d. or 10d. per cubic yard is mentioned, it is to be understood as the average value per cubic yard for the whole mass, including overburden and gravel.

ANNUAL TREATMENT AND PROFITS.

The Company proposes to treat not less than 7,000,000 cubic yards annually, which amount, allowing a value of 1s. 3d. per cubic yard and 5d. (at most) for working cost, gives a net return of at least £290,000 annually.

It is proposed to increase the amount of 7,000,000 cubic yards up to 15,000,000 cubic yards annually. The Company has the areas and will only need to add more digging equipment, the Water and Power Systems being already installed. When the quantity treated is thus being increased, the Company will also draw from its lower grade gravels, thereby augmenting the annual profits.

The yield from some areas will be higher than 1s. 3d. per cubic yard; considerable areas are proved to run up to 2s. 6d. and higher per cubic yard.

The working cost is likely to be lower than 5d. per cubic yard. Every half-penny reduction per cubic yard on the minimum quantity of 7,000,000 cubic yards to be treated annually means an addition of over £14,000 to the net yield.

ANNUAL TREATMENT BY OTHER COMPANIES.

In the same Field the Canadian Klondyke Company is treating about 7,000,000 cubic yards annually and the Yukon Gold Company about 8,000,000 cubic yards annually (the net profit from these 15,000,000 cubic yards is well over £600,000).

In other Fields, such as California, this quantity is exceeded. For example, the Yuba Consolidated Company and the Natomas Consolidated Company treat over 15,000,000 cubic yards each annually.

There is no reason why this Company should not increase its annual yardage up to this higher quantity.

METHODS AND VALUES OF OTHER FIELDS COMPARED.

Compared with other fields in respect of appliances and their use the Klondike is second to none. The Californians, working on a very large scale, are at present lower in costs with their 2d. to 3d. per cubic yard against our 3d. to 4½d.; but their values are much lower; their average gravels run about 6d. per cubic yard; their high-grade gravels (about 10d. per cubic yard) would be considered low-grade in Klondike and they have nothing to compare with the 2s. 6d. and upward per cubic yard found over quite large areas in the north. The Siberian values often compare favourably with ours, but their working costs are still far higher than ours, owing to their difficult conditions and comparatively inefficient labour and appliances.

EARLY HAND-METHODS, NECESSARILY IMPERFECT.

The work of the early days was done with pick and shovel on the small detached claim. Whatever method was used, whether drifting underground or open cutting, the work was necessarily faulty—an attempt to get the cream of the "pay-dirt." A considerable proportion of the gold was lost from the small amount of gravel washed. Even so the yield was very large. In many claims the rich patches, thus crudely worked, yielded from £200,000 to £300,000 per claim of two or three acres and in one case a half-acre claim produced £150,000. The primitive "rocker" worked by the solitary Miner and capable of dealing with about two cubic yards per day, would often give £300 to the day's work. No wonder the old "rocker" (now a mere sampling machine for the test-holes that precede the large modern operations) calls up glowing memories of palmy days when men counted their yield in ounces, not in pence, per cubic yard.



Plate 22. Shows the machine of the early days when every man shovelled his own gravel for himself and treated it in this "Rocker" or in a short sluice way (see Plate 23).

The method of pick and shovel working as practised in the early years on these areas without the assistance of machinery was subject to many handicaps. The high cost of labour and supplies so far away from the bases of supply on the Pacific Coast kept the cost

of working very high (seldom less than 8s. per cubic yard, frequently more). Thus only selected rich patches could be worked. Under such conditions hurry and waste were natural and in the claims thus partly worked by hand methods we find the following conditions prevalent :—

(1) A varying amount of gold left in the tailings. In such short sluiceways the washing was necessarily imperfect and the recovery of gold very incomplete.



Plate 23. Shows the short sluiceway or washing trough, in which the early miners washed the gravel. It is impossible to save all the gold in this short steep runway. The bucket is shown discharging gravel into the sluiceway. Water is pumped up into it for washing the gravel.

(2) Blocks of virgin ground left because not rich enough to stand the then prevailing high costs.

(3) Patches of rich ground left by accident or of necessity.

(4) Gold left in the bedrock, which was more difficult and more expensive to work with pick and shovel than the gravel.

THE RE-WORKING BY MACHINERY OF HAND-WORKED CLAIMS PROVED PROFITABLE.

The above conditions account for the very large additional yield obtained in recent years by re-working with heavy machinery ground already worked before. There has been no exception to this profitable result in the large experience of such re-working in the District.

Such ground, after having been worked once, often twice, and sometimes a third time, and producing about £400,000 per mile from this pick and shovel working, has in the last four years, when re-worked with machinery by the Yukon Gold Company, yielded we.l over £300,000 per mile additional, making a total of £700,000 per mile in all.

On the areas of the North West Corporation hardly any of the patches worked by hand have been worked twice over, and most of the work was poorly done in the rush to get the richest stuff out quickly. For this reason, and on account of the large proportion of virgin ground still remaining, the areas of the North West Corporation, thus worked to a small extent should not produce less than £400,000 per mile.



Plate 21. Shows a part of the wide Sulphur Valley. The little white heaps are heaps of gravel from the early workings and our recent test-holes. This is one of the many areas not touched since 1900—almost entirely virgin.

These areas have so far yielded about £9,000,000, or an average of £300,000 per mile in the parts attempted by faulty hand methods; hardly any of these have been worked twice over, production having been stayed for the most part since 1904 with the knowledge that, by consolidating large areas under one control, the cost of working could be greatly reduced. **Only one-twentieth** of the total areas has been worked at all, and that very imperfectly.

The capital of the North West Corporation is only at the rate of £20,000 per mile of the controlled areas. This low capitalisation has been rendered possible by the fact that the agreements, under which these areas have been acquired from the numerous small owners, were made by the founders of this Company and their friends before the present notable reduction in working costs was effected or even believed in as possible by the majority.

GENERAL CONDITIONS IN THE KLONDIKE.

The general conditions applicable to this Company's working are as follows:—

(1) A very healthy climate.

(2) A very low cost of management (one farthing per cubic yard already and certain to fall still further).

(3) The dryness of the climate contributes to long life of plant. Depreciation requires no greater allowance here than elsewhere. One penny per cubic yard is ample allowance for maintenance and redemption of plant and equipment.

(4) The year is limited to about eight months of active digging, from April to December; but for about half this time it is light all night—a great help to open-air working. The work is pushed night and day every day throughout the Season.

(5) Labour is abundant and highly efficient, though expensive.

(6) Easy transportation of material and supplies at a moderate cost for the distance.

In general. the disadvantages against the district can be summarised as dear labour and increased cost of plant owing to added cost of transportation. With regard to these, labour is replaced for the most part by machinery. One excavating plant with 20 men now digs as many cubic yards daily as 20 men, with pick and shovel only, used to do in the whole season. With regard to transportation, a heavy machine, once set up, is good for many years, so that the slightly raised cost of installation, when thus spread, is hardly noticeable, especially in these rich gravels.

It amounts to this, that with a cost of production slightly higher, at best, than the average of California, the most highly favoured of other countries, we produce immensely more gold per unit of plant employed by reason of the much greater richness of our gravels.

For example, the many excavating plants at work in the north are digging gravels which frequently run 6s. per cubic yard for weeks together and seldom yield lower than 1s. per cubic yard, even for a day. One machine last year produced over £80,000 from 172,000 cubic yards in 75 days. Another (in by no means the best ground) has produced since July, 1908, nearly £240,000. Thus it can be seen how favourable a prospect these northern gravels offer to organised industry. Indeed, the working costs are already rapidly approximating those of countries with a less rigorous winter, while the values remain far higher than the average values found elsewhere.

FOUNDERS CONTINUE TO GIVE THEIR SERVICES AND THE PROPERTIES WERE PAID FOR IN SHARES.

The men who early saw the great advantages to be secured and worked together to secure them, remain in the Company as Shareholders, some of them participating in the London and Klondike Management, thus ensuring to the Company the necessary local experience and skill. These founders and their friends in the course of building up this important consolidation have furnished over £700,000 in cash in addition to shares, to purchase the properties and to instal the Electric Power and Water Systems—the heaviest items in their equipment. Nevertheless they have taken out no cash ; the properties and the rights transferred to the North West Corporation have been paid for by the Company entirely in shares. These "old-timers" of course are the best judges of the profits to be made by this Company in working these large areas connectedly on the basis of 5d. or under per cubic yard, where they were accustomed to spend 8s. per cubic yard for working in the early days.

In addition, the founders, the Directors and their friends have undertaken to provide the £200,000 needed for working capital and for the remainder of the equipment to treat the minimum amount of 7,000,000 cubic yards annually.

THE CLIMATE AND THE WORKING SEASON.

1. The Length of the Open Season.

So much has been said about the severity of the Klondike climate that it may be well to note the following facts. January and February are as a rule continuously severe, not fit for outdoor work. March brings milder days and more sunshine. In April the sun is growing warm again in the middle of the day and outdoor work can be resumed. Digging can commence again in ground prepared for digging, and before the end of the month the snow is melting fast in all the parts of the country exposed to the sun and the water is flowing in the Creeks again. The days are rapidly growing long and by early May the Spring sun is growing hot and beginning to thaw the surface of the country. Before the end of May it is light all night and the previous winter's frost has disappeared from the surface of the earth in all exposed places. The waters are flowing freely down the hillsides and in all the tributaries; snow remains only in places sheltered from the sun. In early June Summer is established and the weather is fine and hot. Early in July thunderstorms usually occur, with heavy showers. The fine hot weather continues normally through August. At the end of August or early in September the autumn rains usually commence and last off and on until toward the end of September. Any time after the middle of September these rains can turn to snow, the effect on the water supply of the country being the same, because any snow which falls in September melts again and passes off as water. By the begining of October the nights are growing markedly colder and a severe frost can occur with a fall of the temperature to near zero. There is, however, as yet nothing to hamper the work of excavation with heavy machinery. If sharp frost occurs for several nights in succession, the water supply rapidly falls off in the smaller valleys. During October coldish spells alternate with warm spells. By October 24th we usually have our first really cold weather, in which the temperature falls for a spell down to 25 degrees below zero. This spell may last for three days, sometimes for ten days, and is followed by much warmer weather and usually by considerable falls of snow lasting through November and into December. Heavy modern machinery can work in the important valleys until early December. By mid-December or soon thereafter the cold weather becomes established and out-door work ceases.



Plate 25.– Canal-building in the Klondike District in November. There is a crust of frozen ground on the surface but the soil is thawed beneath and the machines all work [illegible] beneath.

The ground ordinarily freezes to about six feet deep and this frost does not disappear from it until the following May. If therefore we desire to preserve the surface thawed all winter, we must flood it with water, whose surface will freeze into ice and take all or the worst of the winter's cold. In Spring we can shatter the thick ice with dynamite and dig the gravels thus kept in a thawed condition.

In connection with the length of the Season it should be remembered that this work is essentially open-air work and in May, June, July and part of August it is light all night, so that the electric light, which is used in the cuts at night, is not then needed ; the work is pushed day and night continuously every day from the beginning to the end of the Season.

CONDITIONS ORDINARY FOR MAINTENANCE OF LARGE WORKS.

Canals and other large works often present difficulty in their construction in the north owing to the frozen ground ; but after construction the conditions soon become ordinary and maintenance presents no special features of difficulty and cost. The canals and ditches have proved very economical to maintain when properly constructed without undue haste, in the Klondike district. With proper knowledge of the local conditions no risk of loss need be encountered. The cost of power from the hydro-electric installations, and of water from the ordinary canals, compares not unfavourably with those of other countries at 1d. per cubic yard treated.

ENGLISH COMPANIES IN EARLY KLONDIKE.

It can now very easily be understood why the few English Companies working in the Klondike in the early years failed. They had purchased small detached claims (for the most part quite good ones) on a fictitious basis as to gross value and cost of working. They found themselves confined to hand-methods, unable to make any important reduction in working cost, because unable to control the requisite large areas. This required capital and patience and knowledge of local conditions—all difficult to command at that date. Now, however, the country is better understood ; already the northern conditions are beginning to seem less severe ; the difficulties and the high costs are disappearing rapidly.

TREATMENT IN BULK PAYS WELL.

Doubtless many will consider our values very low for Klondike and will wonder why, seeing that we have so much rich ground yielding 1s. 3d. to 2s. 6d. per cubic yard, we have acquired the lower-grade ground, which we estimate at only 10d. per cubic yard. The answer is our low working cost enables us to treat even these lower grade areas at a handsome profit. Gravels yielding 10d. per cubic yard can be worked for from 3d. to 5d. per cubic yard, and of this lower grade (10d.) ground we have a very large amount indeed. Out of such gravels (10d. per cubic yard) the Canadian Klondyke Company has already this season recovered upwards of 80,000 ounces of gold (£160,000 net profit, approximately), with only four excavators at work on a property which can easily support ten such machines, if desired, for a long term of years. **Its cost is about 3½d. per cubic yard.** The effect of this low cost in stimulating production cannot be over-estimated. The low-grade areas already show very large profits ; the areas can now be worked in bulk without selecting the richer patches. This means increased gross and net yields and very long life.



Plate 26.—Shows the tiny early workings—mere specks in the wide pay-channel of the Lower Dominion Valley. The early miners worked these small spots by hand. Modern methods take in the full width and depth of the gravel-beds, treating all the material in order to recover all the gold.

NEW DISTRICTS IN THE NORTH.

The rapid progress made in the Klondike in developing economical methods of treating the gravels has encouraged other Districts and there is considerable promise of profitable production from several new Fields. Beyond question the gold-bearing gravels are widely distributed in the Yukon Territory and in Alaska ; and the conditions, although they may seem repellent at first, upon closer study are usually found to be nothing out of the way. There is an almost entirely virgin Field open for the profitable employment of the methods which are bringing the North into favour on its merits, *i.e.*, by good results. It always had the gold ; it now has the profits in sight as well.

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